

## **REMARKS / ARGUMENTS**

### **I. General Remarks**

Please consider the application in view of the following remarks. Applicants thank the Examiner for his careful consideration of this application.

### **II. Disposition of Claims**

Claims 1-7, 33, and 34 are pending in this application. Claims 1-7, 33, and 34 stand rejected under 35 U.S.C. § 103(a).

### **III. Rejections of Claims Under § 103(a)**

#### **A. Rejections of Claims Over *Phillips***

Claims 1-7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,002,125 to Phillips *et al.* ("*Phillips*"). With respect to these rejections, the Office Action states:

Applicants argue against the rejection on the ground that the Phillips *et al* patent does not disclose the step of "derivativizing a polysaccharide with a metal coordinating group to produce a derivativized polysaccharide having bidentate ligands," as recited in instant Claim 1. The differences between the process disclosed in the instant claims and the process described in the Phillips *et al* patent appear only to be in how the authors have chosen to provide descriptions of substantially the same process. While the instant claims provide more detail of the steps used carry out the instantly claimed process that involves derivativizing the polysaccharide and crosslinking the derivativized polysaccharide, the Phillips *et al* chose to describe the procedure as a crosslinking process, *wherein derivativization of the polysaccharide is inherently included in the crosslinking procedure*. Just as disclosed in the instant Claims, the Phillips *et al* patent discloses closely similar, if not identical, polysaccharides, metal coordinating groups, bidentate ligands and crosslinking agents used to carry out the process thereof. *There is no indication in the Phillips et al patent that the final product thereof is different from the metal ion crosslinked polysaccharide obtained in the process of the instant claims*. Accordingly, the rejection of Claims 1-7 under 35 U.S.C. 103(a) as being unpatentable over the Phillips *et al* patent is maintained for the reasons of record.

(Office Action at ¶ 5) (emphasis added.) Applicants respectfully disagree.

To form a basis for a § 103(a) rejection, a prior art reference must teach or suggest each element in the claim. MANUAL OF PATENT EXAMINING PROCEDURE ("MPEP")

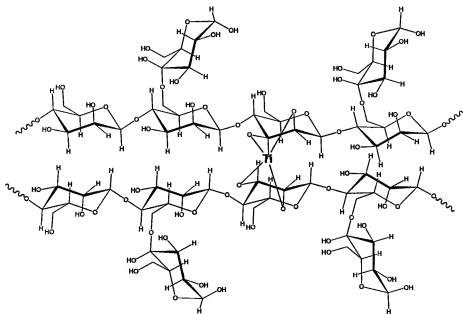
§ 2142 (2007). Moreover, as in this case, where a reference must be modified to achieve the claimed invention, “obviousness can only be established . . . where there is some teaching, suggestion, or motivation to do so.” *Id.* at § 2143.01 (citing *In re Kahn*, 441 F.3d 977, 986, 78 USPQ2d 1329, 1335 (Fed. Cir. 2006)). “The teaching, suggestion, or motivation must be found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art.” *Id.* Applicants respectfully submit that a person of skill in the art would not be motivated to employ the process disclosed in *Phillips* to “derivatiz[e] a polysaccharide with a metal coordinating group to produce a derivatized polysaccharide having bidentate ligands,” as recited in claim 1.

The Office Action acknowledges that *Phillips* does not teach or suggest this step. (See Office Action at ¶ 5.) In the previous non-final office action, the Examiner asserted that this step was obvious because “the skilled artisan would have expected the analogous starting materials to react similarly,” and thus would have been motivated to use the method of cross-linking a polysaccharide to form a derivatized polysaccharide having bidentate ligands. (See Office Action mailed December 15, 2006 at ¶ 5.) The Office Action now rephrases this assumption, asserting that the “derivatization of the polysaccharide is *inherently included* in the crosslinking procedure” described in *Phillips*. (Office Action at 5 (emphasis added).) However, the Office Action provides no evidentiary support for this assertion. See MPEP at § 2144.02 (“[W]hen an examiner relies on a scientific theory, evidentiary support for the existence and meaning of that theory must be provided.”) If official notice of this assumption is to be taken, “the basis for such reasoning must be set forth explicitly,” and the Office Action “must provide specific factual findings predicated on sound technical and scientific reasoning to support [the] conclusion of common knowledge.” *Id.* at § 2144.03 (B). The Office Action provides no factual findings or technical reasoning to support the assertion that “derivatization of the polysaccharide is *inherently included* in the crosslinking procedure.”

In fact, the crosslinking procedure described in *Phillips* does not include the derivatization procedure recited in Applicants’ claims, as evidenced by the structures resulting from those two different procedures. Applicants respectfully disagree that “[t]here is no indication in [*Phillips*] that the final product thereof is different from the metal ion crosslinked polysaccharide obtained in the process of the instant claims.” (Office Action at 3.) To the contrary, a person of skill in the art would know that the process of crosslinking a polysaccharide

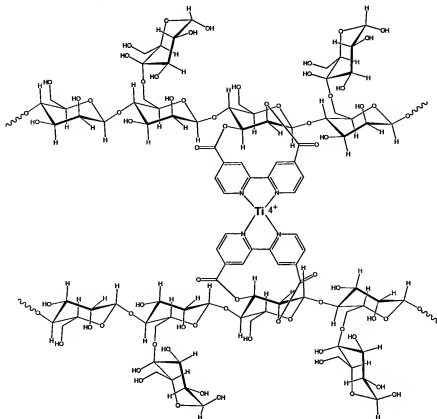
as described in *Phillips* produces structurally different products from those produced with the methods recited in claim 1. As discussed in Applicants' prior response (mailed April 13, 2007), derivatizing and cross-linking are completely different chemical reactions involving different reaction conditions and reaction times and result in completely different molecular structures.

*Phillips* discloses titanium acetylacetonate merely as a conventional crosslinker in an aqueous, which supplies titanium ions for coordinating with the guar molecules. (See *Phillips* at col. 10, ll. 11-15 ("Cross-linking agents... include multivalent metal ions such as titanium . . ."); see also U.S. Patent No. 4,553,601 to Almond *et al.*, col. 7, l. 65 - col. 8, l. 15 (titanium acetylacetonate is a crosslinking agent that "suppl[ies] the titanium (IV) ions for crosslinking").) Thus, persons of skill in the art would understand that, in the crosslinking processes described in *Phillips*, the titanium ions may interact with polysaccharide molecules without derivatizing them with the ligands associated with the metal ion, for example, as shown below:



In its use as a crosslinker, the titanium acetylacetonate crosslinker undergoes hydrolysis in water, wherein the ligands are displaced from this complex, and the titanium ions in solution crosslink polymer molecules, as shown above. See Harry *et al.*, "Chemical Structures of Group 4 Metal Crosslinkers for Polygalactomannans," SPE 50731, at Equation 5 (1999). (A copy of this paper is submitted with this Response for the Examiner's convenience.) This process does not, however, necessarily produce any polysaccharide derivatized with the ligands.

In contrast, Applicants' claim 1 recites derivatizing a polysaccharide with a metal coordinating group to produce a derivatized polysaccharide. For example, guar may be derivatized with bipyridine ligands, which then become crosslinked to form a metal ligand coordination complex (as claim 1 recites), which differs from the structure that persons of skill in the art would understand *Phillips* to produce:



Thus, contrary to the Examiner's assertion, the methods recited in Applicants' claims may yield structurally different products from those produced with the crosslinking processes described in *Phillips*, and the crosslinking process described therein does not "inherently include" the derivatization of polysaccharides recited in Applicants' claims.

Applicants also respectfully remind the Examiner that the prior rejections of Applicants' claims under 35 U.S.C. § 102 (see Final Office Action dated June 1, 2006 at ¶¶ 5-6) were based on the assertion that *Phillips* describes a process that inherently includes the derivatization step recited in claim 1, but that rejection was reversed by the Panel Decision from Pre-Appeal Brief Review. (See Notice of Panel Decision from Pre-Appeal Brief Review mailed October 6, 2006.) As Applicants established in overcoming that rejection, derivatizing and

cross-linking are completely different chemical reactions that result in completely different molecular structures.

Further, a person of skill in the art would not be motivated to use the procedures disclosed in *Phillips* to perform the derivatization step recited in claim 1 since, as Applicants have discussed in their prior responses, derivatizing and cross-linking are completely different chemical reactions that result in completely different molecular structures (for example, as illustrated in Equations 2 and 3 of Applicants' specification, respectively). (See Amendment and Response to Non-Final Office Action Mailed December 8, 2005 (response filed March 8, 2006) at 5; Amendment and Response to Non-Final Office Action Mailed December 15, 2006 (response filed April 13, 2007) at 7.) As Applicants' own specification illustrates, cross-linking interactions and derivatization reactions typically involve completely different reaction conditions (e.g., reaction time). For instance, in the experiments described in Examples 1 and 2 of Applicants' specification, the cross-linking interactions occurred almost immediately (Example 1, ¶ [025]) or within about a minute (Example 2, ¶ [029]), whereas the derivatization steps in those experiments required stirring for a period lasting overnight (Example 1, ¶ [024]) or 8 hours (Example 2, ¶ [028]). The cross-linking reaction produced using the procedures disclosed in *Phillips* is described as being "rapid enough to cause effective cross-linking prior to entry into the formation," where the cross-linking agent is introduced into a fracturing fluid at a well site immediately prior to its introduction into a subterranean formation. (See *Phillips* at col. 11, ll. 44-46; *id.* at col. 12, ll. 40-50.) There is no teaching that this procedure used to cross-link polymers in such a short period of time could be modified to perform a derivatization that, in some cases, may take several hours to complete. Rather, a person of skill in the art would recognize these significant differences, and thus would not assume that a procedure only used for cross-linking in *Phillips* could be used to derivatize a polysaccharide with a metal coordinating group to produce a derivatized polysaccharide having bidentate ligands, even if the starting materials used in that procedure are similar to those used in a derivatization process.

Applicants also incorporate herein all of their remarks set forth in their previous responses showing that it would not be obvious to a person of ordinary skill in the art to modify the methods described in *Phillips* to perform the derivatization step recited in claim 1.

Therefore, Applicants respectfully assert that, because there is no motivation to modify the procedures disclosed in *Phillips* to perform the methods recited in claim 1, that claim

is allowable over *Phillips*. Moreover, since “a claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers,” and since claims 2-7 depend, either directly or indirectly, from independent claim 1, these dependent claims are allowable for at least the same reasons. See 35 U.S.C. § 112 ¶ 4 (2004). Accordingly, Applicants respectfully requests the withdrawal of these rejections.

**B. Rejections of Claims Over *Phillips* in View of U.S. Patent No. 5,888,927**

Claims 33 and 34 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Phillips* as applied to claims 1-7 above, in view of U.S. Patent No. 5,888,927 to McCulloch *et al.* (“*McCulloch*”). With respect to these rejections, the Office Action states:

Applicants claim the method of Claim 1 wherein the bidentate ligands comprise 2,2'-bipyridine.

The Phillips *et al* patent discloses polymers useful in the formation of stable fracturing fluid, which include polysaccharides and polysaccharide derivatives, wherein guar, hydroxypropyl guar, hydroxyethyl guar, cellulose and its derivatives, and xanthan are set forth as examples (see column 9, last paragraph and column 10, lines 1 and 2). The Phillips *et al* patent discloses cross-linking agents in combination with solutions of polymeric thickening agents, which include multivalent metal ions, wherein iron is listed as an example of a multivalent metal ion that may be used in the combination. Phillips *et al* discloses that the combination of cross-linking agents and polymers include admixing guar and its derivatives as a polymer with a cross-linking agent, wherein compounds suitable for use as crosslinking agents include acetylacetonate ions in the form of titanium acetylacetonate (see column 10, 2<sup>nd</sup> full paragraph). The Phillips *et al* patent discloses that titanium acetylacetonate is an effective agent for hydroxypropyl guar or carboxymethyl hydroxypropyl cellulose (see column 10, lines 28-30). The guar, hydroxypropyl guar and hydroxyethyl guar of the Phillips *et al* patent anticipate the guar, hydroxy ethyl and hydroxyl propyl derivatives of gums in instant Claim 2. The iron disclosed in column 10, line 14 of the Phillips *et al* patent embraces the iron disclosed in instant Claims 3 and 7, and the titanium acetylacetonate disclosed in the Phillips *et al* patent at line 26 of column 10 embraces the acetylacetonate ions disclosed in instant Claim 4. Also, see column 3, lines 61-64 of the Phillips *et al* patent wherein it is disclosed that the fracturing fluid thereof is introduced into a well and displaced from the wellhead down the well to the vicinity of the subterranean formation, which embraces the subject matter of instant Claim 6.

The instantly claimed method of crosslinking a polysaccharide of Claims 33 and 34 differs from the information disclosed in the Phillips et al by claiming that the bidentate ligands comprise 2,2'-bipyridine.

However, the McCulloch et al patent, which discloses mineralizing agents being used to partially dissolve silica, shows that the substitution of the acetylacetonate disclosed in the Phillips et al patent with 2,2'-bipyridine is well known in the art. See column 4, lines 50-57 of the McCulloch et al patent, wherein the mineralizing agents thereof include organic complexing agent that may be selected as acetylacetonate and 2,2'-bipyridine as well as ethylenediamine, which is also disclosed in instant Claim 4 as a bidentate ligand.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time Applicants invention was made to substitute the acetylacetonate used in the process for crosslinking polysaccharides in the Phillips et al patent with 2,2'-bipyridine *in view of the recognition in the art, as suggested by the McCulloch et al patent, that 2,2'-bipyridine is an effective substitute for acetylacetonate for use as a complexing agent in the silica arts.*

One of ordinary skill in this art would combine the teaching of the Phillips et al patent with the teaching of the McCulloch patent since both patents disclose procedures that involve the use of complexing agents to carry out their processes.

(Office Action at ¶ 6 (emphasis added).) Applicants respectfully disagree.

To form a basis for a § 103(a) rejection, a prior art reference must teach or suggest each element in the claim. MPEP at § 2142. Moreover, as in this case, where references must be combined modified to achieve the claimed invention, "obviousness can only be established . . . where there is some teaching, suggestion, or motivation to do so." *Id.* at § 2143.01. "The teaching, suggestion, or motivation must be found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art." *Id.* Applicants respectfully submit that neither *Phillips* nor *McCulloch* teaches or suggests "derivatizing a polysaccharide with a metal coordinating group to produce a derivatized polysaccharide having bidentate ligands," as recited in claims 1 (from which claim 33 depends) and 34, nor is there any suggestion or teaching to modify the processes and compositions disclosed in *Phillips* to use 2,2'-bipyridine ligands taught in *McCulloch*.

First, *Phillips* and *McCulloch* do not teach or suggest each element of the claims. As discussed above, a person of skill in the art would not be motivated to employ the process

disclosed in *Phillips* to perform the step of “derivatizing a polysaccharide with a metal coordinating group to produce a derivatized polysaccharide having bidentate ligands,” as recited in claim 1 (from which claim 33 depends), or to produce a metal ion crosslinked polysaccharide made from such a process, as recited in claim 34. Nor does *McCulloch* provide this teaching.

Moreover, one would not be motivated to substitute the acetylacetonate used in *Phillips* with 2,2'-bipyridine disclosed in *McCulloch*. As the Office Action acknowledges, *McCulloch* teaches using bipyridine as a complexing agent used to “partially dissolv[e] silica.” (*McCulloch* at col. 4, ll. 43-55.) However, this teaching provides no suggestion to substitute bipyridine as the ligand in a titanium crosslinking agent as disclosed in *Phillips*, or to use it in derivatizing polysaccharides as recited in claims 33 and 34, nor is there any indication that such a substitution would be successful. The mere fact that bipyridine and acetylacetonate are mentioned in the same paragraph in *McCulloch* does not provide such a teaching.

Therefore, Applicants respectfully assert that, because *Phillips* and *McCulloch* do not teach each element of claims 33 and 34, and there is no motivation to modify or combine the procedures disclosed in *Phillips* and *McCulloch* to perform the methods recited in claim 33, or to produce the composition recited in claim 34, those claims are allowable over *Phillips* and *McCulloch*.

#### **IV. No Waiver**

All of Applicants' arguments and amendments are without prejudice or disclaimer. Additionally, Applicants have merely discussed example distinctions from the cited references. Other distinctions may exist, and Applicants reserve the right to discuss these additional distinctions in a later Response or on Appeal, if appropriate. By not responding to additional statements made by the Examiner, Applicants do not acquiesce to the Examiner's additional statements. The example distinctions discussed by Applicants are sufficient to overcome the rejections and objections stated in the Office Action.

#### **SUMMARY AND PETITION FOR A TWO-MONTH EXTENSION OF TIME TO FILE THIS RESPONSE**

In light of the above remarks, Applicants respectfully request reconsideration and withdrawal of the outstanding rejections. Applicants further submit that the application is now in condition for allowance, and earnestly solicit timely notice of the same. Should the Examiner have any questions, comments or suggestions in furtherance of the prosecution of this

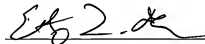


application, the Examiner is invited to contact the attorney of record by telephone, facsimile, or electronic mail.

Applicants hereby petition under the provisions of 37 C.F.R. § 1.136(a) to extend the time for reply to the Office Action mailed on June 22, 2007 for 2 months from September 22, 2007 to November 22, 2007.

The Commissioner is hereby authorized to debit Baker Botts L.L.P.'s Deposit Account No. 02-0383, Order Number 063718.0175, in the amount of \$450.00 for the two-month extension of time to file this Response. Should the Commissioner deem that any additional fees are due, including any fees for extensions of time, the Commissioner is authorized to debit Baker Botts L.L.P. Deposit Account No. 02-0383, Order Number 063718.0175, for any underpayment of fees that may be due in association with this filing.

Respectfully submitted,



Elizabeth L. Durham  
Registration No. 59,509  
BAKER BOTTS L.L.P.  
One Shell Plaza  
910 Louisiana  
Houston, TX 77002  
Telephone: 713.229.2104  
Facsimile: 713.229.7704  
Email: liz.durham@bakerbotts.com

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